MARC AGUERT [1], VIRGINIE LAVAL [2], NADIA GAUDUCHEAU [3],
HASSAN ATIFI [3], MICHEL MARCOCCIA [3]
[1] University of Caen Normandy, PALM (EA 4649)
[2] University of Poitiers, CeRCA (UMR 6234)
[3] Troyes Technological University, Tech-CICO, ICD (UMR 6281)

PRODUCING IRONY IN ADOLESCENCE: A COMPARISON BETWEEN FACE-TO-FACE AND COMPUTER-MEDIATED COMMUNICATION

The literature suggests that irony production expands in the developmental period of adolescence. We aimed to test this hypothesis by investigating two channels: face-to-face and *computer-mediated communication* (CMC). Corpora were collected by asking seventh and 11th graders to freely discuss some general topics (e.g., music), either face-to-face or on online forums. Results showed that 6.2% of the 11th graders' productions were ironic utterances, compared with just 2.5% of the seventh graders' productions, confirming the major development of irony production in adolescence. Results also showed that adolescents produced more ironic utterances in CMC than face-to-face. The analysis suggested that irony use is a strategy for increasing in-group solidarity and compensating for the distance intrinsic to CMC, as it was mostly inclusive and well-marked on forums. The present study also confirmed previous studies showing that irony is compatible with CMC.

Key words: irony, sarcasm, production, adolescence, computer-mediated communication, forums

Introduction

Irony has aroused considerable interest among researchers and prompted a great many studies in psycholinguistics. However, these studies have focused almost exclusively on irony comprehension. Research on irony production only began about 15 years ago, with Gibbs (2000)'s groundbreaking paper examining

Address for correspondence: Marc Aguert, UFR de Psychologie, Campus 1, Esplanade de la Paix, BP 5186, 14032 Caen Cedex 5, France. E-mail: marc.aguert@unicaen.fr

irony in conversation among friends. From a developmental standpoint, children appear to produce few ironic utterances (Pexman, Zdrazilova, McConnachie, Deater-Deckard, & Petrill, 2009), whereas this form of nonliteral language is quite frequent in young adults (Gibbs, 2000). Adolescence seems to be the period in which irony production expands. The current study was designed to answer two questions: Do teenagers produce irony? Does pragmatic competence in producing irony increase in adolescence? Moreover, given that teenagers are big users of *computer-mediated communication* (CMC) devices, we investigated possible quantitative or qualitative differences in the production of ironic utterances between *face-to-face communication* (F2F) and CMC.

Three Observations Drawn from the Irony Production Literature

To date, there has been little research on irony production, owing to several methodological obstacles. Researchers must collect substantial corpora if they are to have sufficient ironic utterances to analyze. These corpora are tricky to build because irony production is closely tied to the topic of conversation (Gibbs, 2000), the characteristics of the participants (Ivanko, Pexman, & Olineck, 2004) and the context of the interaction (Kotthoff, 2003). This corpus-analytic methodology is therefore subject to differences in corpus constitution and irony coding that make the literature difficult to sum up. Nevertheless, we can make three observations based on pioneering studies of verbal irony production.

1. Irony is not a marginal trope in adults. Gibbs (2000) taped 62 ten-minute conversations in various contexts. Participants were students interacting with one or more friends. Gibbs found that 8% of all conversational turns in his corpus were ironic. This quantitative analysis corroborated those undertaken by Tannen (1984, as cited in Gibbs, 2000), who found that irony was used in 7% of all conversational turns, and by Hancock (2004, see below). Dews, Winner, Nicolaides, and Hunt (1995, as cited in Dews & Winner, 1997) looked at popular television comedy shows to determine the frequency of irony usage in these contexts. They showed that 30-minute segments each averaged 4.25 instances of irony. For their part, Kreuz, Roberts, Johnson, and Bertus (1996) showed that readers of contemporary American literature encounter approximately one instance of irony every four pages. It should be noted that irony takes many different linguistic forms. It does not only refer to counterfactual statements, as a survey of the irony comprehension literature might lead one to believe. Gibbs (2000) suggested that there at least are five types of irony: jocularity, sarcasm, hyperbole, rhetorical questions, and understatements. Because of this great variety of ironic forms, it is difficult to determine the best linguistic unit for analyzing ironic occurrences: Sometimes a single word or even an interjection is ironic;

sometimes it is the entire text that is ironic (Burgers, van Mulken, & Schellens, 2011).

2. Irony is usually produced in conjunction with linguistic and paralinguistic markers (Attardo, 2000b; Muecke, 1978). This is widely acknowledged, and as early as the 1970s, Cutler (1976) tried to describe the *ironic tone of voice*, a specific prosodic pattern accompanying ironic statements. Many studies have investigated how paralinguistic cues support irony comprehension (e.g., Laval & Bert-Erboul, 2005), but only a few have confirmed that people do indeed produce such cues in natural discourse. Gibbs (2000) acknowledged that most of the ironic utterances in his corpus were produced with an ironic tone of voice, but he also noted that there was no single prosodic pattern. Bryant and Fox Tree (2002) came to a similar conclusion when they analyzed spontaneous ironic speech extracted from talk-radio shows. These authors found that prosodic information allowed participants to infer ironic intent, although they did not manage to acoustically describe a specific ironic tone of voice (Bryant & Fox Tree, 2005). In the F2F condition of his study, Hancock (2004) observed that 29% of the ironic utterances produced by participants were cued by prosody. He also identified other cues, including laughter (34%), amplifier words (21%), and facial expressions (15%). Attardo, Eisterhold, Hay, and Poggi (2003) showed that a specific facial expression, characterized as a *blank face*, can be a visual cue of sarcasm. Recently, Caucci and Kreuz (2012) provided extra evidence that sarcasm can be signaled by facial cues, such as movements of the head, eyes or mouth, and by laughter. Studies investigating irony production not in F2F but in CMC[1] have also shown that people use cues to signal their ironic intentions (Hancock, 2004; Whalen, Pexman, & Gill, 2009). These cues are partly specific to CMC: expressive punctuation, capital letters, emoticons, written onomatopoeia, and interjections. Hancock, however, underlined that cues signaling irony were less frequent in CMC than in F2F.

3. Irony is commonly used in CMC. In the last 15 years, research on verbal irony production has been stimulated by the rapid development of this new but massively used communicative environment. At first glance, CMC would seem poorly suited to the use of irony. Early publications described this channel as cold and impersonal, inappropriate for expressing feelings, emotions or attitudes (e.g., Sproull & Kiesler, 1986). It is certainly true that many of the cues available in F2F, like prosody and facial expressions, are lacking in CMC. One could thus hypothesize that irony either does not occur in CMC or, if it does, that it is not well understood. However, this hypothesis has been clearly contradicted by several studies highlighting irony production in instant messaging (Hancock, 2004), emails (Whalen et al., 2009), and personal blogs (Whalen, Pexman, Gill & Nowson, 2013).

Hancock (2004), who compared irony production in CMC and F2F, even found that there was more irony in his CMC condition than in his F2F condition. Why there is more irony in CMC than in F2F is not fully understood yet.

The Developmental Issue

To our knowledge, only two studies have so far focused on children's production of verbal irony: those by Recchia, Howe, Ross, and Alexander (2010) and by Pexman et al. (2009). Recchia et al. (2010)'s results are tricky to interpret, because although these authors talk about "production of verbal irony", an attentive examination of the definitions and examples they give suggests that not all the occurrences of nonliteral language they found in their corpus were ironic. For instance, they assume that "compared to the intended meaning, the literal meaning of hyperbole is exaggerated (e.g., "I have the biggest sandwich in the world;" (Recchia et al., 2010, p. 256). With no information about the context – was the sandwich very big or very small? – it is difficult to judge whether this hyperbole was ironic or genuine (see Wilson, 2013, for a similar comment on this study). Nevertheless, these authors also examined occurrences in their corpus of sarcasm, which is undoubtedly a form of irony. During 90-minute family interactions at home, 4-year-old children produced 0.06 sarcastic utterances on average, while 6-year-old children produced 0.31 sarcastic utterances on average. Pexman et al. (2009) videotaped triads with one parent and two siblings performing a domino task. The mean number of verbal irony instances per 8-minute session was 0.10 for younger siblings (mean age: 10 years) and 0.12 for older siblings (mean age: 7 years). In sum, children are able to generate verbal irony as early as 5 years, but produce very few ironic utterances compared with adults. It may be that the hierarchical relationship between parents and children prevents the latter from being ironic. Irony can be intended to mock or tease other people, which can be perceived as being cheeky by parents. In any case, it is clear that the 10-year-old children in Pexman et al. (2009)'s study produced far less irony than the adults, indicating that the production of irony must expand after 10 years, during adolescence.

Research in developmental pragmatics has shown that pragmatic skills develop between infancy and late adolescence (Adams, 2002). For instance, Nippold and Taylor (2002) showed that adolescents are more efficient at understanding idioms than children. Nevertheless, adolescence remains an underinvestigated period. Irony comprehension is well documented in children aged 5–10 years (e.g., Ackerman, 1983; Creusere, 1999; Harris & Pexman, 2003; Laval & Bert-Erboul, 2005; Pexman & Glenwright, 2007), but although several studies have shown that even at 11 years, children still do not master irony understanding as well as adults (Aguert & Laval, 2013; Climie & Pexman, 2008; Dews, Winner, Kaplan, & Rosenblatt, 1996), studies investigating improvements in adolescence remain few and far between.

The Current Study

The first contribution of the current study was to focus on an underinvestigated period of development, namely adolescence the period during which pragmatic skills presumably reach the adult standard. In the current study, we investigated irony production in 12- and 16-year-old adolescents. We predicted that the 16-year-olds would produce more irony than the 12-year-olds, both because of late neural development (Giedd, 2008) and because of greater social experience.

The second – original contribution of this study was to consider the production of irony in both F2F and CMC in order to directly investigate whether production in adolescence differs according to medium. To our knowledge, the only previous study to have made this comparison was undertaken by Hancock (2004), who showed that irony production is not the same in these two communicative environments. Surprisingly, he observed more ironic utterances in CMC than in F2F, despite the absence of cues like prosody and facial expressions that reveal ironic intent in F2F. Hancock showed that these cues were partly offset by other cues specific to CMC, like punctuation. Our study differed from Hancock (2004)'s in three main respects. First, the conversation tasks used by Hancock were specifically designed to elicit irony. It was therefore impossible to assess what the normal frequency of ironic utterances would be in CMC. In the present study, participants were invited to discuss very general topics like music or TV, with no additional instructions. Second, Hancock formed stranger-stranger dyads. Although there are many opportunities for talking with strangers, these conversations are not the most representative of our everyday interactions, including CMC, where the rise of social networking has created more and more opportunities for talking with people we already know. Mutual knowledge should favor the production of irony, according to Eisterhold, Attardo and Boxer (2006), who observed that irony occurs more frequently among intimates and acquaintances than among strangers. In a correlation study, Kreuz (1996) showed that the amount of shared knowledge is related to the likelihood that verbal irony will be employed (on this issue, see also Pexman & Zvaigzne, 2004, who showed that "irony goes better with friends"). Third, we did not investigate adult-adult interactions but adolescent-adolescent interactions. Even if things are changing, adults' productions are not as typical of CMC as adolescents' productions. For instance, the former may object to the use of emoticons. They are generally more conservative and closer to traditional writing. As stated by Valkenburgh and Peter (2009, p. 1), "Adolescents are currently the defining users of the Internet".

Despite these three differences, in line with Hancock (2004)'s observations, we hypothesized that adolescents produce more irony in CMC than in F2F, reasoning that irony use may be a compensatory strategy for overcoming the distance inherent to CMC (Walther, 1992). By implicitly criticizing a person or a state of affairs, the ironic speaker admittedly generates distance from those who do not

grasp the irony, but at the same time forges and maintains a close relationship with those who do grasp the intended meaning (Keltner, Capps, Kring, Young, & Heerey, 2001; Myers Roy, 1981).

To support this hypothesis, we investigated two additional issues. First, we looked for the kinds of markers used to signal irony in F2F and CMC. The more markers the adolescents used, the more trouble they would take to be understood (Kreuz, 1996), supporting the view that irony is an *overcoming-distance strategy*. Second, we tried to determine whether the irony produced by the adolescents was more *inclusive* or *exclusive* (Myers Roy, 1981). The purpose of inclusive irony is to reinforce in-group solidarity, whereas that of exclusive irony is to elevate the speaker's own status at the expense of his/her audience. The hypothesis that irony is an overcoming-distance strategy suggested that we would observe more inclusive than exclusive irony in CMC. These two issues are related, insofar as a speaker who produces inclusive irony is presumably more concerned about being understood than a speaker who produces exclusive irony.

Method

Corpora

We collected two distinct corpora to elucidate the roles of medium and age in adolescents' irony production: the CMC (forum) corpus and the F2F corpus. The main characteristics of these two corpora are summarized in Table 1.

CMC (forum) corpus. This corpus was made up of messages collected in two forums created especially for the study and moderated by the first author (forum-aden.fr). There is a very wide range of CMC technologies, but we chose the forum setting because it is truly dedicated to polylogal discussions, and these discussions can easily be archived. The first forum was reserved for an entire class of seventh graders. Over a two-month period, adolescents were invited to interact on the forum during their leisure time. Only class members were allowed to write and read the threads. The forum was divided into four categories–music, TV, sport and love[2]–and participants were free to open any thread they wanted in these categories. These topics were chosen because they were representative of both CMC and F2F conversations and were not exclusive to any one gender. A second forum, working within the same rules, was reserved for a class of 11th graders. The participants in each forum had considerable common ground (all of them were adolescents, lived in the same town, were in the same class) and many mutual acquaintances. Participants were not anonymous to the others, and in addition to their interactions on the forum, they had F2F interactions in the classroom and schoolyard.

Fifteen seventh graders (8 boys, 7 girls; M_{age} = 12 years 8 months, SD = 7 months) posted 120 messages in all, and twelve 11th graders (2 boys, 10 girls; M_{age} = 16 years 10 months, SD = 5 months) posted 124 messages. On forums,

conversational turns are easily identifiable because they match the messages. However, conversational turns are not comparable in CMC and in F2F (Herring, 2001). In the former, because it is not possible to butt in, they are generally longer and express well-developed ideas. To properly compare CMC and F2F, we therefore chose *utterances* as our unit of analysis. An utterance is generally defined as a clause (see Burgers et al., 2011), but even if some conversational turns were smaller than clauses (e.g., interrupted speech or simple exclamations like "Cheers!"), they were still counted as utterances. Thus, the 244 messages we collected were split up into 716 utterances to form the CMC corpus (see Table 1).

Face-to-face corpus. This corpus was made up of the transcripts of eight 10-minute videos. In each video, four students from the same class (seventh or 11th grade) freely discussed one of the four topics used for the CMC corpus, seated around a table. Thus, in the first four videos, seventh graders discussed music, TV, sport and love, and in the last four videos, 11th graders discussed these same topics. Eight seventh graders (7 boys, 1 girl; M_{age} = 12 years 7 months, SD = 8 months) and fourteen 11th graders (2 boys, 12 girls, M_{age} = 16 years 2 months, SD = 4 months) took part in these discussions. To make them more like the discussions on the forums, we decided that some students would randomly take part in several of the four discussions.

The eight 10-minute videos were transcribed using the CLAN tools provided by CHILDES (MacWhinney, 2014). In all, the face-to-face corpus contained 2994 utterances (see Table 1).

Table 1. Main Characteristics of the Two Corpora

	Face-to-face corpus		CMC corpus	
	7th grade	11th grade	7th grade	11th grade
Number of participants	8	14	15	12
Mean age (*SD*)	12;7 (0;8)	16;2 (0;4)	12;8 (0;7)	16;10 (0;5)
Total number of messages	n/a	n/a	120	124
Total number of utterances	1371	1623	302	414
Nature of acquaintance	Classmates		Classmates	
Computer mediation	No		Yes	

To sum up, the two corpora had the same four topics in common. The participants were different, but they were the same ages and were similarly acquainted (classmates). The two corpora differed because the interactions were synchronous in F2F, but not necessarily in CMC. Moreover, the number of speakers per conversation was limited to four people in F2F, whereas all the adolescents in the class could potentially participate in CMC. Finally, the main difference was that the forums were computer mediated. Thus, participants in the CMC corpus wrote their utterances and did not share the same physical location, whereas participants in the F2F corpus spoke and shared the same physical location.

Coding and Characterizing Ironic Utterances

Because irony is implicit (Attardo, 2000a; Utsumi, 2000, among many others), speakers seldom explicitly state that they are being ironic. Consequently, external coders have to judge which utterances are ironic. This implies that ironic and nonironic statements can be cleanly separated from each other by applying some clear criteria taken from a comprehensive and consensual definition of irony. However, such criteria are difficult to find, for in previous studies, the coding was usually based on the coders' folk conceptions (e.g., Eisterhold et al., 2006). Noting this need for an irony identification procedure, Burgers et al. (2011) developed the verbal irony procedure (VIP), a method for identifying irony in natural discourse based on the following definition of an ironic utterance: "an utterance with a literal evaluation that is implicitly contrary to its intended evaluation". This procedure involves determining whether the utterance being judged is descriptive or evaluative. In the latter case, the coder must then decide whether the literal evaluation conveyed by the utterance is incongruent with the context. If it is, and if the reversed evaluation is relevant to the context, the utterance is ironic. Even if this procedure still relies on the subjectivity of a coder, the VIP is an important step toward a better coding of ironic utterances. Irony coding in the present study was based on – but not restricted to – the VIP. Two independent raters including the first author, who had been trained to use this procedure, coded the whole corpora and noted all the utterances they judged to be ironic, whether or not they were critical or humorous. Comparisons between raters revealed good consistency (Cohen's κ = 0.89 for F2F and 0.80 for CMC). Disagreements were discussed and conservatively resolved.

Once the raters had decided that an utterance was ironic, they then had to answer the following two questions:

1. Is the irony signaled by specific markers, that is, apart from the actual contextual (or cotextual) incongruity? In this case, do these markers make the irony completely explicit or only cued? We distinguished between *no markers*, *emphasizing markers* that attracted the addressees' attention to the contextual incongruity and cued the irony, and *explicit markers* that

made the irony completely explicit. Given the implicit nature of irony, the presence of explicit markers, often produced immediately after the ironic utterance (e.g., "I'm kidding"), might seem surprising. There is, however, empirical evidence for the use of such explicit markers, including in CMC. For instance, Kunneman, Liebrecht, van Mulken, and van den Bosch (2015) reported that numerous sarcastic tweets are marked with the explicit hashtag "#sarcasm". Inter-rater agreement was satisfactory (Cohen's κ = 0.69 for F2F and 0.70 for CMC). For a summary and some examples of the different markers we found in the two corpora, see Table 2.

Table 2. Different Kinds of Markers in Each Corpus

	Emphasizing markers	**Explicit markers**
F2F	– Rhetorical devices like rhetorical questions (e.g., "Why did she come?") – Linguistic amplifiers (adjectives or adverbs used to exaggerate or minimize a statement; e.g., "…with the ultra-handsome Nicolas Hulot [French TV presenter]") – Ironic prosody – Ironic facial expressions – Gestures	– Laughter – Verbal clarifications (e.g., "I'm kidding")
CMC	– Rhetorical devices – Linguistic amplifiers – Emoticons (e.g., 😜) – Expressive use of punctuation and capital letters (e.g., "INCREDIBLE!!!!")	– All the means used to express laughter and joking in CMC: abbreviations (e.g., "lol"), emoticons, onomatopoeia (e.g., "uh-uh") – Verbal clarifications

2. Are the ironic utterances exclusive or inclusive? According to Myers Roy (1981), irony has two uses in discourse: expressing negative judgments about someone or something (exclusive); or reinforcing camaraderie or solidarity (inclusive). As a form of teasing, irony can serve either negative (face-threatening) or positive (face-saving) functions in interpersonal interactions (Brown & Levinson, 1987; Keltner et al., 2001). We operationalized these two types of irony as follows. *Exclusive irony* was either (a) sarcastic irony[3] targeting one or more people in the audience (e.g., "Thanks for this truly earth-shattering information!" to the previous speaker), or (b) nonsarcastic irony designed to be grasped by only part of the audience. *Inclusive irony* included (a) sarcasm aimed at a third party, someone not in the audience (e.g., "Lola always wears such cool shoes", about a character in the Spanish TV drama "Un Paso Adelante" who wears platform shoes, which were not in fashion anymore when the corpus was collected), (b) nonsarcastic irony understandable by all of the audience, or (c) self-mocking irony aimed at the speaker him/herself. We assumed that inclusive irony would develop bonds with others through shared play, whereas exclusive irony would weaken such bonds. Raters were highly consistent in judging whether the ironic utterances were exclusive or inclusive (Cohen's κ = 0.71 for F2F and 0.78 for CMC).

Results

Ironic Utterance Frequency

The numbers of ironic utterances counted in the corpora are displayed in Table 3. Analyses were conducted with Pearson's chi-squared (χ^2) tests. Yates' correction for continuity was applied when expected frequencies were below 10.

Table 3. Number (Percentage) of Ironic Utterances According to Age and Medium

	7th grade	11th grade	**Total**
Face to face (F2F)	35 (2.55%)	88 (5.42%)	**123 (4.11%)**
Forum (CMC)	7 (2.32%)	39 (9.42%)	**46 (6.42%)**
Total	**42 (2.51%)**	**127 (6.23%)**	**169 (4.56%)**

Overall, and as expected, the adolescents produced more nonironic utterances (95.4% of all utterances) than ironic ones (4.6%), $\chi^2(1) = 3064$, $p < 0.001$. Analysis showed a significant effect of age: 11th graders produced more ironic utterances (6.23% of their utterances) than seventh graders (2.51% of their utterances), $\chi^2(1) = 29.30$, $p < 0.001$. The effect of medium was also significant: Adolescents produced more ironic utterances in CMC (6.42%) than in F2F (4.11%), $\chi^2(1) = 7.13$, $p = 0.008$. Nevertheless, Figure 1 and the age comparisons show that the effect of medium was significant in 11th grade, $\chi^2(1) = 9.02$, $p = 0.003$, but not in seventh grade, $\chi^2(1) = 0.06$, ns, indicating an interaction between the two factors.
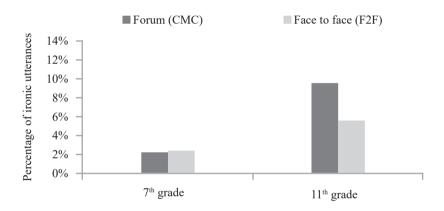
Figure 1. Percentage of ironic utterances according to age and medium

Although our study was not designed to investigate the influence of topic on irony production, we nonetheless looked for possible differences in irony production between the four topics given to the participants. Occurrences of ironic utterances were indeed found to vary between the topics, $\chi^2(3) = 29.18$, $p < 0.001$. Unsurprisingly, love elicited the most ironic utterances (39.6% of all ironic utterances), and music the fewest (10.7%). Sport elicited 22.5% of all ironic utterances and TV 27.2%.

Ironic Markers

Our first question was whether there were any markers of irony (be they explicit markers or simply cues). Overall, the data showed that ironic utterances were more often flagged by markers (80.5% of ironic utterances) than unaccompanied by markers (19.5% of ironic utterances), $\chi^2(1) = 62.77$, $p < 0.001$ (see Table 5).

In the latter case, recipients had to rely solely on the contextual (or cotextual) incongruity to figure out the irony. Further analysis showed that there was no significant difference between the media (76.1% of ironic utterances with markers in CMC vs. 82.1% in F2F; Yates corrected $\chi^2(1) = 0.44$, *ns*). However, there was a significant effect of age, with the seventh graders using markers in 92.9% of their ironic utterances, compared with 76.4% for the 11th graders (Yates corrected $\chi^2(1) = 4.46$, $p = 0.035$).

Our second question was which marked ironic utterances were more common, those with emphasizing markers or those with explicit markers? In the following analyses, utterances that contained both emphasizing and explicit markers (13% of all ironic utterances) were grouped with utterances with explicit markers, as explicit markers facilitate comprehension more than emphasizing markers. Analysis showed that irony was more frequently cued with emphasizing markers (66.2% of marked ironic utterances, 53.3% of all ironic utterances) than clarified with explicit markers (33.8% of marked ironic utterances, 27.2% of all ironic utterances), $\chi^2(1) = 14.23$, $p < 0.001$ (see Table 4). Explicit markers were used more in F2F (39.6% of marked ironic utterances) than in CMC (17.1% of marked ironic utterances), $\chi^2(1) = 5.85$, $p = 0.015$. There was no significant difference with age.

Table 4. Number (Percentage) of Ironic Utterances According to Age, Medium and Type of Marker

	7th grade		11th grade		**Total**
	F2F	CMC	F2F	CMC	
No markers	3 (8.57%)	0 (0%)	19 (21.59%)	11 (28.21%)	**33 (19.53%)**
Emphasizing markers	23 (65.71%)	2 (28.57%)	38 (43.18%)	27 (69.23%)	**90 (53.25%)**
Explicit markers*	9 (25.71%)	5 (71.43%)	31 (35.23%)	1 (2.56%)	**46 (27.22%)**

*Some ironic utterances with explicit markers were also associated with emphasizing markers.

Exclusive versus Inclusive Irony

Overall, the adolescents produced more inclusive (72.8%) than exclusive (27.2%) ironic utterances, $\chi^2(1) = 35.08$, $p < 0.001$ (see Table 5). Further analyses

showed that there was more inclusive irony in CMC (93.5% of ironic utterances) than in F2F (65% of ironic utterances), $\chi^2(1) = 13.67$, $p < 0.001$. Moreover, 11th graders produced more inclusive irony (77.2% of their ironic utterances) than 7th graders (59.5% of their ironic utterances), $\chi^2(1) = 4.96$, $p = 0.026$.

Table 5. Number (Percentage) of Ironic Utterances According to Age, Medium and Type of Irony (Exclusive vs. Inclusive)

	7th grade		11th grade		**Total**
	F2F	CMC	F2F	CMC	
Exclusive irony	2 (28.57%)	1 (2.56%)	15 (42.86%)	28 (31.82%)	**46 (27.22%)**
Inclusive irony	5 (71.43%)	38 (97.44%)	20 (57.14%)	60 (68.18%)	**123 (72.78%)**

Discussion

The goal of the present study was to examine irony production in adolescents, as the literature had suggested that the ability to produce irony mainly develops during adolescence (Gibbs, 2000; Pexman et al., 2009). As adolescents are big users of CMC, and as Hancock (2004) surprisingly showed that adults produce more irony in CMC than in F2F, we also investigated adolescents' production of irony in CMC in order to try and replicate these findings. However, unlike Hancock, who deliberately chose topics that would elicit irony production, we let participants interact freely on general teenage topics such as love and music, which seemed to us to constitute a more ecological setting for establishing frequencies of irony usage in F2F and CMC.

Overall, results showed that 4.6% of the utterances produced by adolescents were ironic – a frequency consistent with the literature indicating adolescence to be a transitional stage between 10-year-old children, who produce very little verbal irony (Pexman et al., 2009), and adults, 8% of whose conversational turns are ironic (Gibbs, 2000). However, this figure hid considerable disparity in irony production between early and late adolescence, as we found that 16-year-old

students produced twice as many ironic utterances as 12-year-old students. This result confirmed that adolescence is a crucial period in the development of language, particularly at the pragmatic level (Nippold, 2007). Our result did not allow us to speculate about the determinants of these developments, but recent neuroscience studies have shown that adolescence is a period of change, particularly in the domain of social cognition (Blakemore, 2008; Blakemore & Choudhury, 2006), which is closely tied to irony comprehension and production (Channon, Pellijeff, & Rule, 2005).

Like adults, the adolescents in our study did not struggle to produce irony in CMC, even though the communication was asynchronous, and speakers and addressees did not share the same spatial location. Indeed, as in Hancock (2004), we found that there were significantly more ironic utterances in CMC that in F2F. In his study, Hancock was not able to decide between two explanations for the increased irony in CMC. Given that the physical distance inherent to computer mediation sets up a relational distance between speaker and addressee, irony may be used precisely because of this distance, as speakers are less concerned with creating a positive social impression and do not really care whether or not they are understood. Then again, *social information processing theory* (Walther, 1992) predicts that users will try to compensate for this distance by various means and irony, which is also known to create bonds between people who share it, could be one of these means. To help resolve this issue, we asked whether adolescents use markers to signal their ironic intent, and whether they produce more exclusive or inclusive irony (Myers Roy, 1981).

Analysis of the ironic markers revealed that more than three quarters of ironic utterances were signaled with markers, and there was no significant difference between F2F and CMC, suggesting that the two settings enable speakers to signal irony in an equivalent manner. In the wake of Hancock (2004) and Whalen et al. (2009, 2013), our study confirms that the idea that CMC is not suitable for producing irony because of the lack of nonverbal cues (prosody and facial expressions) is obsolete. Some markers were the same across both settings (e.g., amplifier words) while others were specific either to F2F (e.g., prosody) or to CMC (e.g., punctuation and other typographic devices). One surprising result of this study is that almost 30% of ironic utterances produced by adolescents were explicitly ironic. Adolescents used markers that left no doubt as to how their utterances should be interpreted. In particular, in F2F, speakers' laughter following ironic utterances was coded as an explicit marker, and this laughter was quite common. This could explain why there were significantly more explicit ironic utterances in F2F than in CMC. This result questions the implicit nature of irony. Gibbs (2000) noted that ironic statements were sometimes followed by addressees laughing (in 12–25% of cases), but he did not mention anything about speakers laughing after making their ironic statements. This could be specific to adolescents, and we can imagine that experienced speakers who have mastered "the art of being

clear without being obvious" (Muecke, 1969, as cited in Hancock, 2004) produce less explicit markers. Apart from the issue of whether or not irony is made explicit, our results confirm that irony is usually produced in conjunction with linguistic and paralinguistic markers, whether in F2F or CMC. Even the younger adolescents were found to use these markers. In fact, the younger adolescents used markers to signal their ironic intention more frequently than the 16-year-olds did. If there is any developmental trend, it is that these markers are used less automatically and are more tailored to the context, but always with a view to being understood.

Results showed that a large majority of ironic utterances (72.8%) were inclusive. More interesting, the adolescents were more inclusive in CMC than in F2F. This result supports the view that irony is a means of developing bonds with others in a communicative environment where interpersonal relationship is reduced, owing to the absence of the nonverbal cues that are used to express relational information in F2F (Hancock, 2004; Walther, 1992). Whalen et al. (2009) observed that very few of the nonliteral statements they studied were directed at the e-mail recipient. According to these authors, such targeted nonliteral statements may be too threatening in CMC, which supports the view of an inclusive use of irony. The ability to use inclusive irony as a means of forging bonds seems to improve in adolescence since only older adolescents produce more ironic utterances in CMC than in F2F. Younger adolescents may not yet understand that irony is a good way of forging bonds in CMC. Along the same lines, we observed that the 16-year-olds used more inclusive irony than the 12-year-olds. These exploratory observations about the use of inclusive or exclusive irony during adolescence are consistent with the work of Sherer and Clark (2009), who showed that as teenagers grow older, teasing is most often initiated to have fun, and with studies demonstrating that bullying behaviors decrease with age in adolescence, after a peak when pupils move up from primary to secondary school (Griffin & Gross, 2004). They are also consistent with the work of Pexman, Glenwright, Krol, and James (2005), who found that the humorous and teasing functions of irony are not well understood in late childhood (i.e., 7- to 10-year-olds). The greater proportion of inclusive irony may also be partly explained by the fact that our participants were girls in majority (30 girls out of 49 participants). Indeed, previous studies showed that females use less sarcasm (Gibbs, 2000) and less aggressive humor (Martin, Puhlik-Doris, Larsen, Gray, & Weir, 2003) than males.

As reported in previous studies (Gibbs, 2000; Whalen et al., 2009), this kind of research has several limitations. The main one is in judging if an utterance is ironic or not. Inter-rater agreement coefficients were quite good, as the raters agreed about the vast majority of utterances that were not ironic. Even so, there were long discussions about many utterances where it was difficult to come to a decision. Two problems emerged. First, it was sometimes hard to judge whether a speaker who did not provide markers had a genuine or an ironic communicative intention. This problem was exacerbated by the judges' lack of knowledge about

the topics being discussed. In these cases, we adopted a conservative line. One possible solution would be for adolescents to code their own corpus. Second, many utterances were obviously not genuine, but were they ironic for all that? The boundaries between mocking, humorous and ironic statements are very unclear. This is maybe why Hancock (2004) did not retain jocularity as a form of irony as Gibbs (2000) did. Among several other issues, some occurrences were so lexicalized that they could have been produced without the speaker even being aware of the irony (e.g., "Great Mary! You piss me off"). We encountered other cases where the ironic intention was quite clear, but where we wondered about the linguistic nature of the communication act. Is laughter (e.g., "hu-hu-hu…" produced with a jaded prosody to ironically mean "very funny!") or a deceitfully admiring whistle an ironic utterance? Another limitation is that we requested adolescents to have unconstrained peer-to-peer interactions, but they knew that these interactions were designed to be analyzed. This methodology lowered the ecological validity of the results and limited the size of the corpora.

To conclude, the present study contributes in at least two ways to the issue of irony production. First, in line with previous literature, our data confirm that CMC is not an unsuitable environment for producing irony, dispelling the longstanding idea that CMC is a cold, impersonal and inappropriate medium for expressing feelings, emotions and attitudes (Sproull & Kiesler, 1986). There is evidence that irony occurs in instant messaging (Hancock, 2004), e-mails (Whalen et al., 2009), personal blogs (Whalen et al., 2013), and now Internet forums. In line with Hancock (2004), this study supports the social information processing theory (Walther, 1992), which claims that irony is relevant in CMC to the extent that it compensates for the relational distance introduced by the computer. We found that not only was the irony we collected via the forums properly marked, but also that CMC irony was more inclusive than F2F irony. Second, in a more original contribution, the present study demonstrates that the development of irony production mainly takes place in adolescence. It sheds light on a period of development that deserves more attention, from the standpoints of both the production and comprehension of irony (Aguert & Laval, 2013). Additional research is required to refine methods and to clarify the developmental trajectories and factors that lead children to become adult speakers producing irony in 8% of their conversational turns (Gibbs, 2000).

Footnotes

[1]   We only considered written CMC technologies here. CMC technologies allowing oral interactions (e.g., Skype) need to be considered separately.

[2]   The "love" (sic) forum dealt with romantic and sexual issues.

[3]   Sarcasm is a subtype of verbal irony that is intended to criticize, ridicule, or mock the target (Lee & Katz, 1998).

Acknowledgments

References

Ackerman, B.P. (1983). Form and function in children's understanding of ironic utterances. *Journal of Experimental Child Psychology*, *35* (3), 487–508.

Adams, C. (2002). Practitioner Review: The assessment of language pragmatics. *Journal of Child Psychology & Psychiatry & Allied Disciplines*, *43* (8), 973–987.

Aguert, M. & Laval, V. (2013). Request complexity is no more a problem when the requests are ironic. *Pragmatics & Cognition*, *21* (2), 329–339.

Attardo, S. (2000a). Irony as relevant inappropriateness. *Journal of Pragmatics*, *32* (6), 793–826.

Attardo, S. (2000b). Irony markers and functions: Towards a goal-oriented theory of irony and its processing. *Rask*, *12*, 3–20.

Attardo, S., Eisterhold, J., Hay, J., & Poggi, I. (2003). Multimodal markers of irony and sarcasm. *Humor*, *16* (2), 243–260.

Blakemore, S-J. (2008). The social brain in adolescence. *Nature Reviews Neuroscience*, *9* (4), 267–277.

Blakemore, S-J. & Choudhury, S. (2006). Development of the adolescent brain: implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry*, *47* (3-4), 296–312.

Brown, P. & Levinson, S. C. (1987). *Politeness: Some Universals in Language Usage*. Cambridge, MA: University Press.

Bryant, G.A. & Fox Tree, J.E. (2002). Recognizing verbal irony in spontaneous speech. *Metaphor & Symbol*, *17* (2), 99–119.

Bryant, G.A. & Fox Tree, J.E. (2005). Is there an ironic tone of voice? *Language and Speech*, *48* (3), 257–277.

Burgers, C., van Mulken, M., & Schellens, P.J. (2011). Finding irony: An introduction of the Verbal Irony Procedure (VIP). *Metaphor and Symbol*, *26* (3), 186–205.

Caucci, G.M. & Kreuz, R.J. (2012). Social and paralinguistic cues to sarcasm. *Humor*, *25* (1), 1–22.

Channon, S., Pellijeff, A., & Rule, A. (2005). Social cognition after head injury: Sarcasm and theory of mind. *Brain and Language*, *93* (2), 123–134.

Climie, E. A., & Pexman, P. M. (2008). Eye gaze provides a window on children's understanding of verbal irony. *Journal of Cognition and Development*, *9* (3), 257–285.

Creusere, M. (1999). Theories of adults' understanding and use of irony and sarcasm: Applications to and evidence from research with children. *Developmental Review*, *19* (2), 213–262.

Cutler, A. (1976). Beyond parsing and lexical look-up: An enriched description of auditory sentence comprehension. In R. Wales & E. Walker (Eds.), *New Approaches to Language Mechanisms* (pp. 133–150). Amsterdam: North-Holland.

Dews, S. & Winner, E. (1997). Attributing meaning to deliberately false utterances: The case of irony. In C. Mandell & A. McCabe (Eds.), *Advances in Psychology* (Vol. 122, pp. 377–414). Amsterdam: North-Holland.

Dews, S., Winner, E., Kaplan, J., & Rosenblatt, E. (1996). Children's understanding of the meaning and functions of verbal irony. *Child Development*, *67* (6), 3071–3085.

Eisterhold, J., Attardo, S., & Boxer, D. (2006). Reactions to irony in discourse: Evidence for the least disruption principle. *Journal of Pragmatics*, *38* (8), 1239–1256.

Gibbs, R.W. (2000). Irony in talk among friends. *Metaphor & Symbol*, *15* (1–2), 5–27.

Giedd, J.N. (2008). The teen brain: Insights from neuroimaging. *Journal of Adolescent Health*, *42* (4), 335–343.

Griffin, R.S. & Gross, A.M. (2004). Childhood bullying: Current empirical findings and future directions for research. *Aggression and Violent Behavior*, *9* (4), 379–400.

Hancock, J.T. (2004). Verbal irony use in face-to-face and computer-mediated conversations. *Journal of Language and Social Psychology*, *23* (4), 447–463.

Harris, M. & Pexman, P.M. (2003). Children's perceptions of the social functions of verbal irony. *Discourse Processes*, *36* (3), 147–165.

Herring, S. (2001). Computer-mediated discourse. In D. Schiffrin, D. Tannen, & H. Hamilton (Eds.), *The Handbook of Discourse Analysis* (pp. 612–634). Oxford: Blackwell.

Ivanko, S.L., Pexman, P.M., & Olineck, K.M. (2004). How sarcastic are you? Individual differences and verbal irony. *Journal of Language and Social Psychology*, *23* (3), 244–271.

Keltner, D., Capps, L., Kring, A.M., Young, R.C., & Heerey, E.A. (2001). Just teasing: A conceptual analysis and empirical review. *Psychological Bulletin*, *127* (2), 229–248.

Kotthoff, H. (2003). Responding to irony in different contexts: On cognition in conversation. *Journal of Pragmatics*, *35* (9), 1387–1411.

Kreuz, R.J. (1996). The use of verbal irony: Cues and constraints. In J.S. Mio & A.N. Katz (Eds.), *Metaphor: Implications and Applications* (pp. 23–38). Hillsdale, NJ: Erlbaum.

Kreuz, R.J., Roberts, R.M., Johnson, B.K., & Bertus, E.L. (1996). Figurative language occurrence and co-occurrence in contemporary literature. In R.J. Kreuz & M.S. MacNealy (Eds.), *Empirical Approaches to Literature and Aesthetics* (pp. 83–97). Norwood, NJ: Ablex.

Kunneman, F., Liebrecht, C., van Mulken, M., & van den Bosch, A. (2015). Signaling sarcasm: From hyperbole to hashtag. *Information Processing & Management*, *51* (4), 500–509.

Laval, V. & Bert-Erboul, A. (2005). French-speaking children's understanding of sarcasm: The role of intonation and context. *Journal of Speech, Language and Hearing Research*, *48* (3), 610–620.

Lee, C.J. & Katz, A.N. (1998). The differential role of ridicule in sarcasm and irony. *Metaphor & Symbol*, *13* (1), 1–15.

MacWhinney, B. (2014). *The Childes Project: Tools for Analyzing Talk (3rd ed.)*. New York, NY: Psychology Press.

Martin, R.A., Puhlik-Doris, P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the Humor Styles Questionnaire. *Journal of Research in Personality*, *37* (1), 48–75.

Muecke, D.C. (1978). Irony markers. *Poetics*, *7* (4), 363–375.

Myers Roy, A. (1981). The function of irony in discourse. *Text*, *1* (4), 407–423.

Nippold, M.A. (2007). *Later Language Development: School-Age Children, Adolescents, and Young Adults*. Austin, TX: PRO-ED.

Nippold, M.A. & Taylor, C.L. (2002). Judgments of idiom familiarity and transparency: A comparison of children and adolescents. *Journal of Speech, Language, and Hearing Research*, *45* (2), 384–391.

Pexman, P.M. & Glenwright, M. (2007). How do typically developing children grasp the meaning of verbal irony? *Journal of Neurolinguistics*, *20* (2), 178–196.

Pexman, P.M., Glenwright, M., Krol, A., & James, T. (2005). An acquired taste: Children's perceptions of humor and teasing in verbal irony. *Discourse Processes*, *40* (3), 259–288.

Pexman, P.M., Zdrazilova, L., McConnachie, D., Deater-Deckard, K., & Petrill, S.A. (2009). "That was smooth, mom": Children's production of verbal and gestural irony. *Metaphor and Symbol*, *24* (4), 237–248.

Pexman, P.M. & Zvaigzne, M.T. (2004). Does irony go better with friends? *Metaphor and Symbol*, *19* (2), 143–163.

Recchia, H.E., Howe, N., Ross, H.S., & Alexander, S. (2010). Children's understanding and production of verbal irony in family conversations. *British Journal of Developmental Psychology*, *28* (2), 255–274.

Sherer, S.L. & Clark, R.A. (2009). Changes in teasing patterns from early adolescence to adolescence. *Communication Research Reports*, *26* (3), 175–187.

Sproull, L. & Kiesler, S. (1986). Reducing social context cues: Electronic mail in organizational communications. *Management Science*, *32* (11), 1492–1512.

Utsumi, A. (2000). Verbal irony as implicit display of ironic environment: Distinguishing ironic utterances from nonirony. *Journal of Pragmatics*, *32* (12), 1777–1806.

Valkenburg, P.M. & Peter, J. (2009). Social consequences of the internet for adolescents: A decade of research. *Current Directions in Psychological Science*, *18* (1), 1–5.

Walther, J.B. (1992). Interpersonal effects in computer-mediated interaction. A relational perspective. *Communication Research*, *19* (1), 52–90.

Whalen, J.M., Pexman, P.M., & Gill, A.J. (2009). "Should be fun—not!": Incidence and marking of nonliteral language in e-mail. *Journal of Language and Social Psychology*, *28* (3), 263–280.

Whalen, J.M., Pexman, P.M., Gill, A.J., & Nowson, S. (2013). Verbal irony use in personal blogs. *Behaviour & Information Technology*, *32* (6), 560–569.

Wilson, D. (2013). Irony comprehension: A developmental perspective. *Journal of Pragmatics*, *59* (Part A), 40–56.